

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte RONALD D. LARSON

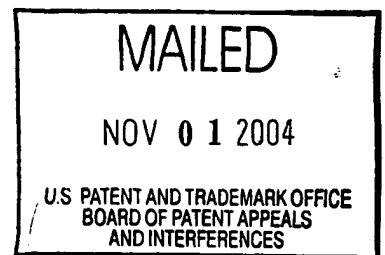
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Appeal No. 2004-0458  
Application 09/172,389

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ON BRIEF

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Before DIXON, BARRY, and MACDONALD, Administrative Patent Judges.  
MACDONALD, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1, 4-11, and 14-18. Claims 2, 3, 12, 13, 19, and 20 have been canceled.

Invention

Appellant's invention relates to a method and apparatus for occlusion testing primitives being processed in a graphics system and for updating a Z pyramid data structure used for occlusion testing. The apparatus comprises logic configured to create the

Z pyramid data structure and to perform occlusion testing. The Z pyramid data structure comprises a plurality of levels, each of which comprises a plurality of regions. Each region comprises a plurality of subregions, each of which corresponds to a single Z value. Each region corresponds to a plurality of Z values and has a maximum region Z value which corresponds to the largest Z value of the region. The logic compares the minimum Z value of each primitive with the Z value of a region associated with the primitive to determine whether or not the primitive is fully occluded.

If a determination is made that the primitive is not fully occluded, the logic determines whether or not any subregion of the region associated with the primitive is fully covered by the primitive. If the logic determines that a subregion is fully covered by the primitive, then the logic determines whether or not the Z value of the covered subregion needs to be replaced with the maximum Z value of the tested primitive. In order for the logic to determine whether the Z value of the covered subregion needs to be replaced with the maximum Z value of the primitive, the logic determines whether or not the maximum Z value of the primitive is less than the Z value for the covered subregion.

If the logic determines that the maximum Z value of the primitive is less than the Z value for the covered subregion, then the Z value for the covered subregion is replaced with the maximum Z value of the primitive. Preferably, the logic maintains a coverage mask for each level of the Z pyramid data structure. Each coverage mask comprises a bit for each subregion of the level of the Z pyramid data structure associated with the coverage mask. When the logic determines that the maximum Z value of the primitive is less than the Z value for the covered subregion, a bit in the coverage make associated with the covered subregion is set. When all of the coverage mask bits corresponding to the subregions of a particular region have been set, a bit is set for the corresponding region in the coverage mask associated with the next level up in the Z pyramid data structure.

When all of the bits in the coverage mask have been set for a particular region, the logic replaces the maximum Z value for the particular region with the maximum Z value of all of the subregions associated with the particular region. When all the bits in the coverage mask have been set for a particular region in the coverage mask, the logic sets the corresponding bit in the coverage mask for the next level up in the Z pyramid.

Preferably, the primitives are occlusion tested in a tiler component of the graphics system and the Z pyramid data structure is updated by the tiler component on the fly as primitives are being processed through the graphics system. The graphics system is comprised as part of a computer graphics display system. The Z pyramid data structure preferably is stored in a Z pyramid memory element which is in communication with the tiler.

Preferably, the Z pyramid memory element is periodically updated with pixel level Z values, i.e., with Z values of primitives which have been scan converted into screen coordinates corresponding to locations on the display monitor. In this way, the Z pyramid data structure can be updated on the fly and can be periodically updated with pixel level Z values to ensure accurate occlusion testing. Appellant's specification at pages 2-4.

Claim 1 is representative of the claimed invention and is reproduced as follows:

1. An apparatus for occlusion testing primitives being processed in a graphics system, each primitive having a minimum Z value and a maximum Z value, the apparatus comprising:

logic configured to create a Z pyramid data structure, the Z pyramid data structure comprising at least first and second levels, each level comprising a plurality of regions, each region comprising a plurality of subregions, each subregion corresponding to a single Z value, each region corresponding to a plurality of Z values and having a maximum region Z value corresponding to the greatest of the Z values of the region, wherein each subregion in the second level has a Z value that corresponds to a maximum Z value of a plurality of subregions in the first level, said logic comparing the minimum Z value of each

primitive with the Z value of a region associated with the tested primitive to determine whether or not the tested primitive is fully occluded, wherein if a determination is made that the tested primitive is not fully occluded, said logic determines whether or not any subregion of the region associated with the tested primitive is fully covered by the primitive, wherein if said logic determines that a subregion is fully covered by the tested primitive, then said logic determines whether or not the Z value of the covered subregion needs to be replaced with the maximum Z value of the tested primitive, wherein said logic to determines whether the Z value of the covered subregion needs to be replaced with the maximum Z value of the tested primitive by determining whether or not the maximum Z value of the tested primitive is less than the Z value for the covered subregion, wherein if said logic determines that the maximum Z value of the primitive is less than the Z value for the covered subregion, then the Z value for the covered subregion is replaced with the maximum Z value of the primitive.

#### References

The references relied on by the Examiner are as follows:

Green et al. (Greene '455)	5,579,455	Nov. 26, 1996
Green et al. (Greene '763)	5,600,763	Feb. 4, 1997
Sudarsky et al. (Sudarsky)	6,008,035	Jul. 11, 2000
(Filed February 23, 1998)		

#### Rejections At Issue

Claims 1, 4-7, 11, and 14-18 stand rejected under 35 U.S.C. § 103 as being obvious over the combination of Greene '455 and Sudarsky.

Claims 8-10 stand rejected under 35 U.S.C. § 103 as being obvious over the combination of Greene '455 and Sudarsky and Greene '763.

Throughout our opinion, we make references to the Appellant's briefs, and to the Examiner's Answer for the respective details thereof.<sup>1</sup>

#### OPINION

With full consideration being given to the subject matter on appeal, the Examiner's rejections and the arguments of the Appellant and the Examiner, for the reasons stated *infra*, we affirm the Examiner's rejection of claims 1, 4-7, 11, and 14-18 under 35 U.S.C. § 103, and we reverse the Examiner's rejection of claims 8-10 under 35 U.S.C. § 103.

We also use our authority under 37 CFR § 41.50(b) to enter a new grounds of rejection of claims 1 and 4-10. The basis for this is set forth in details below.

Appellant has indicated that for purposes of this appeal the claims stand or fall together in four groupings:

Claims 1 and 4-7 as Group I;

Claims 8-10 as Group II;

Claims 11 and 14-17 as Group III; and

Claim 18 as Group IV.

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<sup>1</sup>Appellant filed an appeal brief on October 9, 2001. Appellant filed a reply brief on February 13, 2002. The Examiner mailed out an Examiner's Answer on December 17, 2001.

See page 4 of the brief. Furthermore, Appellant has met the requirements of 37 CFR § 1.192 (c)(7) (July 1, 2002) as amended at 62 Fed. Reg. 53169 (October 10, 1997), which was controlling at the time of Appellant's filing of the brief. 37 CFR § 1.192 (c)(7) states:

*Grouping of claims.* For each ground of rejection which appellant contests and which applies to a group of two or more claims, the Board shall select a single claim from the group and shall decide the appeal as to the ground of rejection on the basis of that claim alone unless a statement is included that the claims of the group do not stand or fall together and, in the argument under paragraph (c)(8) of this section, appellant explains why the claims of the group are believed to be separately patentable. Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable.

We will, thereby, consider Appellant's claims as standing or falling together in the four groups noted above, and we will treat:

Claim 1 as a representative claim of Group I;

Claim 8 as a representative claim of Group II;

Claim 11 as a representative claim of Group III; and

Claim 18 as a representative claim of Group IV.

If the brief fails to meet either requirement, the Board is free to select a single claim from each group and to decide the appeal of that rejection based solely on the selected representative

claim. In re McDaniel, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002). See also In re Watts, 354 F.3d 1362, 1368, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004).

I. Whether the Rejection of Claims 1 and 4-7 Under  
35 U.S.C. § 103 is proper?

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the invention as set forth in claims 1 and 4-7. Accordingly, we affirm.

In rejecting claims under 35 U.S.C. § 103, the Examiner bears the initial burden of establishing a **prima facie** case of obviousness. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). See also In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). The Examiner can satisfy this burden by showing that some objective teaching in the prior art or knowledge generally available to one of ordinary skill in the art suggests the claimed subject matter. In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Only if this initial burden is met does the burden of coming



forward with evidence or argument shift to the Appellant.

*Oetiker*, 977 F.2d at 1445, 24 USPQ2d at 1444. See also *Piasecki*, 745 F.2d at 1472, 223 USPQ at 788.

An obviousness analysis commences with a review and consideration of all the pertinent evidence and arguments. "In reviewing the [E]xaminer's decision on appeal, the Board must necessarily weigh all of the evidence and argument." *Oetiker*, 977 F.2d at 1445, 24 USPQ2d at 1444. "[T]he Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion." *In re Lee*, 277 F.3d 1338, 1344, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002).

With respect to independent claim 1, Appellant argues at page 8 of the brief, "neither Greene et al. ['455] nor Sudarsky discloses, teaches or suggests, either alone or in combination, 'wherein if said logic determines that the maximum Z values of the primitive is less than the Z value for the covered subregion, then the Z value for the covered subregion is replaced with the maximum Z value of the primitive' as recited in independent claim 1." Also at page 8, Appellant argues, "Greene et al. ['455] does not provide a mechanism that is capable of updating the Z pyramid as primitives are being processed through the graphics pipeline, which is what the emphasized language of claim 1 describes." We

do not find these arguments to be persuasive. Greene '455 at column 6, line 67, through column 7, line 1, clearly teaches that the initial Z pyramid for a next frame is the resulting Z buffer for the current frame. As the Examiner pointed out in the rejection (Answer at page 3), the process for setting the values in the Z buffer is found at column 19 of Greene '455. The values in the Z buffer are the initial Z pyramid for a current frame as modified by the Z-max values found during primitive processing for the current frame. We find that this meets the claim limitation.

Appellant argues at page 10 of the brief, that the algorithms of Greene '455 "inherently require that scan conversion be performed before the Z pyramid can be updated," and "[i]n contrast, the present invention enables the Z buffer to be updated and the Z pyramid to be reconstructed prior to scan conversion." We do not find this argument to be persuasive. We have reviewed claim 1, and we do not find any scan conversion limitation in the claim. Further, Appellant's argument contradicts Appellant's statement at page 7 of the brief, "[t]he Z pyramid memory element is periodically updated with pixel level Z values, i.e., with Z values of primitives, which have been scan converted."

At pages 12-14 of the brief and pages 6-9 of the reply brief, Appellant argues that the Examiner has "failed to cite a proper teaching, suggestion or motivation, to alter the Greene et al. ['455] system." We must agree. We find no rationale for modifying Greene ['455] based on Sudarsky. However, we also find that as pointed out by the Examiner (Answer at page 6), "Greene's ['455] teachings alone show the limitations of the claimed invention." We are as much at a loss as Appellant (reply brief at page 7, lines 2-4) to understand the Examiner's argument at page 6, lines 6-12, of the answer. However, our review of claim 1 and the rejection at page 3 of the answer finds that Greene' 455 teaches all the claim limitations.

In view of the above discussion, it is our view, that since Greene '455 teaches all the claim limitations, Sudarsky is not necessary for a proper rejection under 35 U.S.C. § 103 of representative claim 1, as Greene '455 discloses all that is claimed. A disclosure that anticipates under 35 U.S.C. § 102 also renders the claim unpatentable under 35 U.S.C. § 103, for "anticipation is the epitome of obviousness." **Jones V. Hardy**, 727 F.2d 1524, 1529, 220 USPQ 1021, 1025 (Fed. Cir. 1984).

Appeal No. 2004-0458  
Application 09/172,389

See also *In re Francalossi*, 681 F.2d 792, 794, 215 USPQ 569, 571 (CCPA 1982); *In re Pearson*, 494 F.2d 1399, 1402, 181 USPQ 641, 644 (CCPA 1974).<sup>2</sup>

Accordingly, the Examiner's obviousness rejection of representative claim 1 under 35 U.S.C. § 103 is sustained based on Greene '455 alone.

## II. Whether the Rejection of Claims 8-10 Under 35 U.S.C. § 103 is proper?

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the invention as set forth in claims 8-10. Accordingly, we reverse.

With respect to dependent claim 8, Appellant argues at pages 16 of the brief, Greene '763 "is directed to a method to prevent aliasing," and "does not suggest the additional elements of dependent claim 8." The Examiner responds at page 7 of

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<sup>2</sup> The Board may rely on less than all of the references applied by the Examiner in an obviousness rationale without designating it as a new ground of rejection. *In re Bush*, 296 F.2d 491, 496, 131 USPQ 263, 266-67 (CCPA 1961); *In re Boyer*, 363 F.2d 455, 458 n.2 150 USPQ 441, 444 n.2 (CCPA 1966).

"fig. 2C of Greene '763 teaches occlusion testing in a tiler component." We have reviewed figure 2C and do not find this limitation.

As we have discussed above, in rejecting claims under 35 U.S.C. § 103, the Examiner bears the initial burden of establishing a *prima facie* case of obviousness. After a review of the evidence before us, we find that the Examiner has not met initial burden of establishing a *prima facie* case. Therefore, we will not sustain the Examiner's rejection under 35 U.S.C. § 103.

**III. Whether the Rejection of Claims 11 and 14-17 Under  
35 U.S.C. § 103 is proper?**

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the invention as set forth in claims 11 and 14-17. Accordingly, we affirm.

With respect to independent claim 11, Appellant states that, "independent claim 11 is significantly different from independent claim 1 in that it is directed to method steps and not the apparatus of claim 1." (Brief at page 19) We find that Appellant fails to present any further argument to support his contention that the claims are "significantly different."

Rather, Appellant cites language from claim 11 that is nearly identical to language found in claim 1. We have already found that this language does not distinguish over the prior art as discussed above with respect to claim 1. We find that the Appellant has not presented evidence or argument with respect to claim 11 that overcomes the Examiner's establishment of a *prima facie* case.

Therefore, we will sustain the Examiner's rejection under 35 U.S.C. § 103 for the same reasons as set forth above.

**IV. Whether the Rejection of Claim 18 Under 35 U.S.C. § 103 is proper?**

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would have suggested to one of ordinary skill in the art the invention as set forth in claim 18. Accordingly, we affirm.

With respect to independent claim 18, Appellant argues, "the means plus function elements of claim 18 must be construed more narrowly than the corresponding elements of claim 1. Therefore, the rejection of claim 1 does not necessarily apply to claim 18." See the Brief at page 22. We fully agree. However, this point alone is not sufficient to overcome the rejection of claim 18

without some showing that the Examiner has crafted a rejection that covers claim 1, but only covers claim 1 as to claim 1 embodiment(s) that are not covered by claim 18.

We find that Appellant fails to present any further argument to support his contention that the "rejection does not necessarily apply." Rather, Appellant cites language from claim 18 that is nearly identical to language found in claim 1. We have already found that this language does not distinguish over the prior art as discussed above with respect to claim 1. We find that the Appellant has not presented evidence or argument with respect to claim 18 that overcomes the Examiner's establishment of a **prima facie** case.

Therefore, we will sustain the Examiner's rejection under 35 U.S.C. § 103 for the same reasons as set forth above.

**V. Rejection of Claims 1 and 4-10 Under 37 CFR § 41.50(b).**

We make the following new grounds of rejection using our authority under 37 CFR § 41.50(b).

Claims 1 and 4-10 are rejected under 35 U.S.C. § 112, first paragraph, because the specification, while being enabling for claim 18 which covers the corresponding structure described in the specification and equivalents thereof, does not reasonably provide enablement for claim 1 which by its own literal terms

covers any and all logic embodiments including "non-equivalents" which perform the functions recited in claim 1. Appellant himself notes at page 22 of the brief that, "the means plus function elements of claim 18 must be construed more narrowly than the corresponding elements of claim 1." The specification does not enable a person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with claims 1 and 4-10.

We note that functional language, in and of itself, does not render a claim improper. For example, there is no breadth problem when it is obvious that only a very limited group of objects will fall within the claimed category. However, functional language can cause the claim to have a scope beyond that which is justified by the specification, *In re Swinehart*, 439 F.2d 210, 213, 169 USPQ 226, 229 (CCPA 1971). We find this latter situation with respect to claim 1.

Our reviewing court states in *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) that "claims must be interpreted as broadly as their terms reasonably allow." Our reviewing court further states, "[t]he terms used in the claims bear a 'heavy presumption' that they mean what they say and have the ordinary meaning that would be attributed to those words by



persons skilled in the relevant art." **Texas Digital Sys. Inc v. Telegenix Inc.**, 308 F.3d 1193, 1202, 64 USPQ2d 1812, 1817 (Fed. Cir. 2002), **cert. denied**, 538 U.S. 1058 (2003).

Upon our review of Appellant's specification, we fail to find any definition of the term "logic" that is different from the ordinary meaning. We find the ordinary meaning of the term "logic" is best found in the dictionary. We note that the definition most suitable for "logic" is "the circuitry in a computer".<sup>3</sup>

We find that claim 1 covers not just the specific computer circuits described in the specification and equivalents thereof, but a virtually unlimited number of circuitry implementations in a myriad of computer types (e.g., digital, analog, hybrid, fluid). Therefore, we find the specification does not enable a person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with claim 1. Claims 4-10 depend from claim 1 and share the same problem.

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<sup>3</sup>The American Heritage Dictionary, Second College Edition, 1982, page 740. Copy provided to Appellant.

### Conclusion

In view of the foregoing discussion, we have sustained the rejection under 35 U.S.C. § 103 of claims 1, 4-7, 11, and 14-18; and we have not sustained the rejection under 35 U.S.C. § 103 of claims 8-10.

We have entered a new grounds of rejection against claims 1 and 4-10 under 37 CFR § 41.50(b).

As indicated *supra*, this decision contains a new grounds of rejection pursuant to 37 CFR § 41.50(b) (effective September 13, 2004, by final rule notice, 69 Fed. Reg 49960, 50008 (August 12, 2004), 1286 Off. Gaz. Pat. Office 21, 61 (September 7, 2004)). 37 CFR § 41.50(b) provides that, "[a] new grounds of rejection pursuant to this paragraph shall not be considered final for judicial review."

37 CFR § 41.50(b) also provides that the Appellant, **WITHIN TWO MONTHS FROM THE DATE OF THE DECISION**, must exercise one of the following two options with respect to the new grounds of rejection to avoid termination of proceedings (37 CFR § 1.197 (b) (amended effective September 13, 2004)) as to the rejected claims:

- (1) Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner . . .

Appeal No. 2004-0458  
Application 09/172,389

(2) Request that the proceeding be reheard under 37 CFR § 41.52 by the Board upon the same record . . .

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART 37 CFR § 41.50 (b)

*[Handwritten signature]*

JOSEPH L. DIXON  
Administrative Patent Judge

LANCE LEONARD BARRY  
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Appeal No. 2004-0458  
Application 09/172,389

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